IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Pierre Dournel

Application No.: 10/070979 Confirmation No.: 4774

Filed: May 31, 2002 Art Unit: 1732

For: METHOD FOR MAKING POLYMERIC FOAMS Examiner: A. R. Kuhns

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUBSTITUTE APPEAL BRIEF

Ashley I. Pezzner
CONNOLLY BOVE LODGE & HUTZ LLP
Reg. No. 35,646
P.O. Box 2207
Wilmington, DE 19899
(302) 888-6270

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APPEAL BRIEF

I. THE REAL PARTY OF INTEREST

Solvay (Société Anonyme) is the real party of interest. The application was assigned and recorded on May 31, 2002, on Reel No. 013091 and Frame No. 0933.

II. RELATED APPEALS AND INTERFERENCES

The undersigned is not aware of any related appeals or interferences involving this application.

III. THE STATUS OF THE CLAIMS

Claims 1-13 have been cancelled. Claims 14-34 are pending. Claims 21 and 32-33 are allowed. The subject of the appeal are claims 14-20, 22-31 and 34 which are attached in Appendix I.

IV. STATUS OF AMENDMENTS AFTER FINAL

There were no Amendments After Final filed.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The independent claims are claims 14 and 19. The dependent claims that the applicant are arguing are separately patentable are 18, 20, 28, 30, 31 and 34. Claims 14, 18, 19, 20, 28, 30, 31 and 34 are as follows:

14. A process for the manufacture of a polystyrene closed-cell foam in which a blowing agent comprising 1,1-difluoroethane, 1,1,1,2-tetrafluoroethane and optionally an additive is employed (see the specification at page 2, lines 1-4 and page 3, lines 18 and 19 and the original claim 1).

18. The process according to Claim 14, wherein said additive is alcohol (see the specification at page 2, lines 19-20 and the original claim 5).

19. A composition comprising 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane and an alcohol, which composition can be used as blowing agent for the manufacture of polymer-based foams. (see page 2, lines 1-4 and 19-20 and the original claims 8 and 9).

20. The composition according to Claim 19, wherein said alcohol is methanol, ethanol, n-propanol or isopropanol (see the specification at page 2, lines 23-24 and the original claim 10).

28. The process according to Claim 27, wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less (see examples 1-3 of the specification and the table at the top of page 4).

30. The thermal insulation panel according to Claim 24, wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less (see examples 1-3 of the specification and the table at the top of page 4).

31. The thermal insulation panel according to Claim 29, wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less (see examples 1-3 of the specification and the table at the top of page 4).

34. The composition according to Claim 21, containing more than 60% by weight of 1,1-difluoroethane and of 1,1,1,2-tetrafluoroethane. (see page 2, lines 8-10 of the specification and the original claim 4)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claim 34 is rejectable under 35 U.S.C. § 112, second paragraph.

2. Whether claims 14-17, 24-27 and 29 are obvious under 35 U.S.C. § 103 (a) over Smith et al. U.S. Patent No. 5,276,063 ("Smith")?

3. Whether claims 18 and 19 (and claims 22 and 23 which depend from claim 19) which require the use of an alcohol are obvious under 35 U.S.C. § 103 (a) over Smith?

4. Whether claim 20 which requires the use of an alcohol, in particular, methanol, ethanol, n-propanol or isopropanol are obvious under 35 U.S.C. § 103 (a) over Smith?

5. Whether claims 28, 30 and 31 which require a thermal insulation panel wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less is taught or suggested by Smith?

VII. ARGUMENTS

Claim 34

1. Whether claim 34 is rejectable under 35 U.S.C. § 112, second paragraph.

Claim 34 is not rejected over the prior art. Claim 34 further limits allowed claim 21. Claim 34 is supported in the original claim 4 and in the specification at page 2, lines 8-10. Claim 34 states,

> The composition according to Claim 21, containing more than 60% by weight of 1,1-difluoroethane and of 1,1,1,2-tetrafluoroethane.

The applicant believes that it is clear that claim 34 requires more than 60% by weight of both 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane.

Claims 14-17, 24-27 and 29

2. Whether claims 14-17, 24-27 and 29 are obvious under 35 U.S.C. § 103 (a) over Smith?

The applicant's invention is drawn to a process for the manufacture of a polystyrene closed-cell foam in which a blowing agent comprising (1) 1,1-difluoroethane,

(2) 1,1,1,2-tetrafluoroethane and optionally (3) an additive is employed. The applicant's claimed invention requires both 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane.

Smith does not teach the use of 1,1,1,2-tetrafluoroethane ("HFC 134a") as required by the applicant's claimed invention. It is recognized that Smith discloses HFC-134a among a long list of blowing agents at col. 3, line 28 through col. 4, line 6:

> The blowing agent may further comprise small amounts (less than 15 weight percent) of a **tertiary blowing agent** comprising other known blowing agents including inorganic agents, organic blowing agents other than those mentioned above, and chemical blowing agents. Suitable inorganic blowing agents include (1) carbon dioxide, (2) nitrogen, (3) argon, (4) water, (5) air, and (6) helium. Organic blowing agents include aliphatic hydrocarbons having 1-9 carbon atoms and fully and partially halogenated aliphatic hydrocarbons having 1-4 carbon atoms. Aliphatic hydrocarbons include (7) methane, (8) ethane, (9) propane, (10) n-butane, (11) isobutane, (12) n-pentane, (13) isopentane, (14) neopentane, and the like. Fully and partially halogenated aliphatic hydrocarbons include fluorocarbons, chlorocarbons, and chlorofluorocarbons. Examples of fluorocarbons include (15) methyl fluoride, (16) perfluoromethane, (17) difluoromethane (HFC-32), (18) ethyl fluoride, (19) 1,1,1-trifluoroethane (HFC-143a), (20) **1,1,1,2-tetrafluoro-ethane (HFC-134a)**, (21) pentafluoroethane, (22) perfluoroethane, (23) 2,2-difluoropropane, (24) 1,1,1-trifluoropropane, (25) perfluoropropane, (26) perfluorobutane, (27) perfluorocyclobutane. Partially halogenated chlorocarbons and chlorofluorocarbons for use in this invention include (28) methyl chloride, (29) methylene chloride, (30) 1,1,1-trichloroethane, (31) 1,1-dichloro-1-fluoroethane (HCFC-141b), (32) 1-chloro-1,1-difluoroethane (HCFC-142b), (33) 1,1-dichloro-2,2,2-trifluoroethane (HCFC-123) and (34) 1-chloro-1,2,2,2-tetrafluoroethane (HCFC-124). Fully halogenated chlorofluorocarbons include (35) trichloromonofluoromethane (CFC-11), (36) dichlorodifluoromethane (CFC-12), (37) trichlorotrifluoroethane (CFC-113), (38) dichlorotetrafluoroethane (CFC-114), (39) chloroheptafluoropropane, and (40) dichlorohexafluoropropane. Chemical blowing agents include (41) azodicarbonamide, (42) azodiisobutyro-nitrile, (43) benzenesulfonhydrazide, (44) 4,4-oxybenzene sulfonyl-semicarbazide, (45) p-toluene sulfonyl semi-carbazide, (46) barium azodicarboxylate, (47) N,N'-dimethyl-N,N'-

dinitrosoterephthalamide, and (48) trihydrazino triazine.[1] (emphasis added)

HFC-134a is only one out of the 48 specifically disclosed as one of the tertiary blowing agents. None of the examples in Smith disclose the use of HFC-134a.

Smith further states at col. 4, lines

> **A surprising feature of this invention is that it is possible to blow a closed-cell, alkenyl aromatic polymer foam structure using HFC-152a** as the primary blowing agent. The use is surprising in view of its relatively low solubility in alkenyl aromatic polymers, such as polystyrene, and its relatively high vapor pressure. Typically, the ability of a blowing agent to produce a foam structure with relatively large cells has been observed to decrease as its solubility in the polymer decreases and as its vapor pressure increases. **Thus, a blowing agent with relatively low solubility and a relatively high vapor pressure will usually produce a relatively small cell size foam structure**. **A blowing agent with relatively high solubility and relatively low vapor pressure will usually produce a relatively large cell size foam structure.** The process of the present invention is surprising because it does not follow previous observations. (emphasis added)

Table 1 illustrates solubility and vapor pressure data for several common blowing agents. Therefore, from table 1, it is clear that HFC-134a has even a lower solubility than HFC-152a and a higher vapor pressure than HFC-152a. Again, as stated above,

> **" a blowing agent with relatively low solubility and a relatively high vapor pressure will usually produce a relatively small cell size foam structure**. **A blowing agent with relatively high solubility and relatively low vapor pressure will usually produce a relatively large cell size foam structure."** (emphasis added)

Therefore, it would have been expected that HFC-134a would be even less likely to produce **a relatively large cell size foam structure** than HFC-152a or other

[1] The numbers in the brackets were inserted by the applicant.

blowing agents listed in Table 1. This is further confirmed at col. 4, lines 54-68 of Smith,

> Relatively **large cell size alkenyl aromatic polymer foams have been made using HCFC-142b** with or without ethyl chloride. HCFC-142b has **been used successfully in making large cell size foams** because of its **relatively moderate solubility** in alkenyl aromatic polymers and its **relatively moderate vapor pressure**.
>
> Other above-mentioned blowing agents, namely CFC-12, HCFC-22, **HFC-134a, typically have not been successfully employed in making relatively large cell foams due to their relatively low solubility** in alkenyl aromatic polymers and **high vapor pressure**. Given that HFC-152a has similar vapor pressure and solubility in alkenyl aromatic polymers as those blowing agents, it is surprising that a relatively large cell size foam could be produced with it. (emphasis added)

The results for Table 1 also confer that HFC -134a is the worst with respect to solubility. HFC -134a only had a 1.0 solubility. In addition, HFC-134a also had a high vapor pressure (665.4) especially compared to HCFC -142b (337.9). It is interesting to note that the three unsuccessful blowing agents, CFC-12, HCFC-22 and HFC-134a, were the only blowing agents listed in table 1 that had a vapor pressure over 600 (651.3, 1044 and 665.4 respectively). It is also interesting to note that the three unsuccessful blowing agents, CFC-12, HCFC-22 and HFC-134a, were the only blowing agents listed in table 1 that had a solubility less than 1.7 (1.5, 1.6 and 1.0 respectively). In fact, HFC-134a had the lowest solubility of the group.

Smith does teach to combine two blowing agents (a secondary with the first blowing agent being HFC-152a). However, it is clear that the secondary blowing agent can NOT be HFC-134a. Smith states at col. 3, lines 9-27:

> The blowing agent further comprises a **secondary blowing agent** present from between about 10 to less than 50 weight percent and preferably from about 20 to about 40 weight percent based upon the total weight of the blowing agent. The secondary blowing agent **will have a lower vapor pressure in air at 25 ^{0}C. than HFC-152a**. The secondary blowing agent **will further be more soluble in the alkenyl aromatic polymer than HFC-152a**. The secondary blowing agent will preferably have a vapor pressure in air at 25^0 C. of less than 580 kilopascals, and preferably have a solubility in polystyrene (200,000 weight average molecular weight according to size exclusion chromatography) of greater than 1.9 parts per hundred by weight at 25 ^{0}C. per atmosphere of air pressure based upon the weight of the polymer. **Preferred secondary blowing agents are ethyl chloride, ethanol, acetone, methanol, propanol, dimethyl ether, and ethyl acetate. Ethyl chloride is most preferred**. (emphasis added)

HFC-134a can NOT be the secondary blowing agent since it has a higher vapor pressure than HFC-152a (665.4 vs. 598.5). A second reason, HFC-134a can NOT be the secondary blowing agent is because it has a lower solubility than HFC-152a (1.0 versus 1.8). Clearly, for the reasons stated above, Smith teaches away from using HFC-134a as a secondary blowing agent in combination with HFC-152a.

Again, none of the examples use HFC-134a, let alone a combination of HFC-134a and HFC-152a.

The Examiner must consider the reference, Smith, as a whole, In re Yates, 211 USPQ 1149 (CCPA 1981). The applicant disagrees with the Examiner why one skilled in the art with the knowledge of the Smith would selectively modify Smith in order to arrive at the applicant's claimed invention. The Examiner's argument is clearly based on hindsight reconstruction.

Claims 18, 19, 22 and 23

3. Whether claims 18 and 19 (and claims 22 and 23 which depend from claim 19) which require the use of an alcohol are obvious under 35 U.S.C. § 103 (a) over Smith?

The applicant's invention is drawn to a process for the manufacture of a polystyrene closed-cell foam in which a blowing agent comprising (1) 1,1-difluoroethane, (2) 1,1,1,2-tetrafluoroethane and (3) an alcohol. The applicant's claimed invention requires 1,1-difluoroethane, 1,1,1,2-tetrafluoroethane and an alcohol.

As stated above, the applicant does not believe Smith recognized the importance of combining 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane together, let alone with an alcohol as is required by the applicant's claimed invention.

It is recognized as stated above, that Smith discloses at col. 3, lines 9-27:

> The blowing agent further comprises a **secondary blowing agent** present from between about 10 to less than 50 weight percent and preferably from about 20 to about 40 weight percent based upon the total weight of the blowing agent. The secondary blowing agent **will have a lower vapor pressure in air at 25 ^{0}C. than HFC-152a**. The secondary blowing agent **will further be more soluble in the alkenyl aromatic polymer than HFC-152a**. The secondary blowing agent will preferably have a vapor pressure in air at 25^0 C. of less than 580 kilopascals, and preferably have a solubility in polystyrene (200,000 weight average molecular weight according to size exclusion chromatography) of greater than 1.9 parts per hundred by weight at 25 ^{0}C. per atmosphere of air pressure based upon the weight of the polymer. **Preferred secondary blowing agents are ethyl chloride, ethanol, acetone, methanol, propanol, dimethyl ether, and ethyl acetate. Ethyl chloride is most preferred**. (emphasis added)

Ethyl chloride is most preferred." There are three different alcohols disclosed out of the preferred seven possibilities. However, it is noted that the most preferred secondary blowing agent is ethyl chloride which is not an alcohol.

In order to arrive at the applicant's claimed invention, one of ordinary skill in the art would selectively choose 1,1,1,2-tetrafluoroethane as the tertiary blowing agent and an alcohol as the secondary blowing agent. This is not suggested by Smith. There is a lot of manipulation required to arrive at the applicant's claimed invention.

The Examiner must consider the reference, Smith, as a whole, In re Yates, *supra*. The applicant disagrees with the Examiner why one skilled in the art with the knowledge of the Smith would selectively modify Smith in order to arrive at the applicant's claimed invention. The Examiner's argument is clearly based on hindsight reconstruction.

Claim 20

4. Whether claim 20 which requires the use of an alcohol, in particular, methanol, ethanol, n-propanol or isopropanol are obvious under 35 U.S.C. § 103 (a) over Smith?

The applicant's invention is drawn to a process for the manufacture of a polystyrene closed-cell foam in which a blowing agent comprising (1) 1,1-difluoroethane, (2) 1,1,1,2-tetrafluoroethane and (3) an alcohol that is methanol, ethanol, n-propanol or isopropanol. The applicant's claimed invention of claim 20 requires 1,1-difluoroethane, 1,1,1,2-tetrafluoroethane and an alcohol that is methanol, ethanol, n-propanol or isopropanol.

As stated above, the applicant does not believe Smith recognized the importance of combining 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane together, let alone with methanol, ethanol, n-propanol or isopropanol as is required by the applicant's claimed invention.

As stated above, it is recognized that Smith discloses at col. 3, lines 24-27 that secondary blowing agents are "preferably selected from ethyl chloride, ethanol, acetone, methanol, propanol, dimethyl ether, and ethyl acetate. Ethyl chloride is most preferred." It is noted the claimed alcohols are three of the preferred seven possibilities. However, it is noted that the most preferred secondary blowing agent is ethyl chloride which is not an alcohol.

In order to arrive at the applicant's claimed invention, one of ordinary skill in the art would selectively choose 1,1,1,2-tetrafluoroethane as the tertiary blowing agent and methanol, ethanol, n-propanol or isopropanol as the secondary blowing agent. This selection is not suggested by Smith.

The Examiner must consider the reference, Smith, as a whole, In re Yates, *supra*. The applicant disagrees with the Examiner why one skilled in the art with the knowledge of the Smith would selectively modify Smith in order to arrive at the applicant's claimed invention. The Examiner's argument is clearly based on hindsight reconstruction.

Claims 28, 30 and 31

5. Whether claims 28, 30 and 31 which require a thermal insulation panel wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90

days storage at room temperature is 27.0 mW/m.K or less is taught or suggested by Smith?

These claims are related to a thermal insulation panel obtained by the process claimed in claim 14 and wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less. The thermal conductivity is shown in examples 1-3 of the specification and in the table at the top of page 4.

Smith does disclose insulating panels at col. 5, lines 37-38. However, as stated above under the argument with respect to claim 14, Smith does not teach the combination of 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane as is required by the applicant's claimed invention.

Furthermore, Smith does not teach the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less is as is required by the applicant's claimed invention.

It is believed that the claims define an invention which is new, useful, and unobvious. For the above reasons, the applicants request passage to allowance. This brief is being submitted in triplicate.

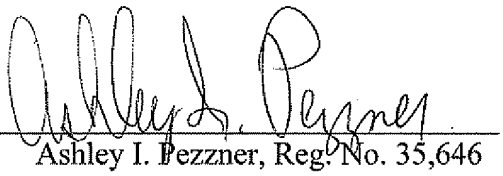
The applicant previously submitted the Appeal Brief on July 17, 2006. The applicant received a Notice of Non-compliant Brief mailed August 8, 2007.

The PTO previously charged Deposit Account No. 03-2775 the amount of $500.00. The Notice of Appeal was filed on April 13, 2006. It is believed that no further extensions are required.

However, in the event that the undersigned is mistaken in his calculations, an appropriate extension of time to respond is respectfully petitioned for, and the Commissioner is hereby authorized to charge the account of the undersigned attorneys, Patent Office Deposit Account No. 03-2775, for any fees which may be due upon the filing of this paper.

Respectfully submitted,

CONNOLLY BOVE LODGE & HUTZ LLP

By 

Ashley I. Pezzner, Reg. No. 35,646
P.O. Box 2207
Wilmington, DE 19899
(302) 888-6270

CLAIMS APPENDIX- CLAIMS ON APPEAL

14. A process for the manufacture of a polystyrene closed-cell foam in which a blowing agent comprising 1,1-difluoroethane, 1,1,1,2-tetrafluoroethane and optionally an additive is employed.

15. The process according to Claim 14, in which the weight ratio of 1,1-difluoroethane to 1,1,1,2-tetrafluoroethane in the blowing agent is at least 1.5.

16. The process according to Claim 15, in which the weight ratio of 1,1-difluoroethane to 1,1,1,2-tetrafluoroethane in the blowing agent is more than 2.

17. The process according to Claim 14, in which the blowing agent contains more than 60% by weight of a mixture of 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane.

18. The process according to Claim 14, wherein said additive is alcohol.

19. A composition comprising 1,1-difluoroethane and 1,1,1,2-tetrafluoroethane and an alcohol, which composition can be used as blowing agent for the manufacture of polymer-based foams.

20. The composition according to Claim 19, wherein said alcohol is methanol, ethanol, n-propanol or isopropanol.

22. The composition according to Claim 19, in which the weight ratio of 1,1-difluoroethane to 1,1,1,2-tetrafluoroethane is at least 1.5.

23. The composition according to Claim 19, containing more than 60% by weight of 1,1-difluoroethane and of 1,1,1,2-tetrafluoroethane.

24. A thermal insulation panel comprising the polystyrene closed-cell foam, obtained using the process according to Claim 14.

25. A thermal insulation panel comprising the polystyrene closed-cell foam, obtained using the process according to Claim 16.

26. A thermal insulation panel comprising the polystyrene closed-cell foam, obtained using the process according to Claim 17.

27. The process according to Claim 14, wherein the polystyrene closed-cell foam contains more than 90% of closed cells.

28. The process according to Claim 27, wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less.

29. The thermal insulation panel according to Claim 24, wherein the polystyrene closed-cell foam contains more than 90% of closed cells.

30. The thermal insulation panel according to Claim 24, wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less.

31. The thermal insulation panel according to Claim 29, wherein the thermal conductivity at 10°C of the polystyrene closed-cell foam after 90 days storage at room temperature is 27.0 mW/m.K or less.

32. The composition according to Claim 21, in which the weight ratio of 1,1-difluoroethane to 1,1,1,2-tetrafluoroethane is at least 1.5.

33. The composition according to Claim 21, in which the weight ratio of 1,1-difluoroethane to 1,1,1,2-tetrafluoroethane is at least 2.3.

34. The composition according to Claim 21, containing more than 60% by weight of 1,1-difluoroethane and of 1,1,1,2-tetrafluoroethane.

EVIDENCE APPENDIX

There is no additional evidence relied upon.

RELATED PROCEEDING APPENDIX

There are no related proceedings.